

Tips for Teaching with Math In a Nutshell™

Math In a Nutshell is a challenging computer software program that is intended to provide learners in grades 4-8 with practice in mathematical problem-solving. Teachers who have tested the program in classrooms find that it is most effective when it is used to extend and enrich classroom activities that teach learners the four basic arithmetical operations and the hierarchy of using these operations when solving equations.

The program is structured into three (3) levels of difficulty. Each level introduces progressively more complex equations that require increased math problem-solving abilities. To find the solutions to these equations, students must have a knowledge of the hierarchy of arithmetical operations and the procedure for using those operations. Simply stated, the hierarchy of operations requires that multiplication and division be completed first before the operations of addition and subtraction. Gifted learners will quickly recognize the process for solving each problem and will be eager to skip to the advanced levels. Most other learners, however, will require an explanation and demonstration of how the hierarchy of operations is applied in the solution of each equation. Once this simple principle is understood, students will be able to advance through the levels by applying this useful problem-solving process.

Hierarchy of Operations

Math In a Nutshell presents all equations in a horizontal format. In most cases, learners insert the appropriate arithmetical signs into the equations working in a normal left to right progression as is illustrated in the following example:

$$4 \ ? \ 2 \ ? \ 3 \ = \ 24$$

The solution requires the learner to simply supply multiplication signs:

$$4 \times 2 \times 3 = 24$$

In similar situations where only simple addition or subtraction is required, the same left to right progression applies:

$$9 \ ? \ 3 \ ? \ 7 \ = \ 5$$

Here the equation is completed by simply adding first and then subtracting:

$$9 + 3 - 7 = 5$$

In short, in situations where multiplication and division are required exclusively to complete the equation or in situations where addition and subtraction are required exclusively, a normal left to right progression of operations is appropriate. However, in situations where adding and subtracting operations are mixed with multiplication and division, then a hierarchy of operations must be used to properly solve the equation. EXAMPLE 1 illustrates this concept:

Example 1

To solve the following equation, one would follow a hierarchy of operations that would require the learner to multiply first and then add:

$$1 \ ? \ 2 \ ? \ 3 \ = \ 7$$

This equation cannot result in 7 without first multiplying 2×3 and then adding 1 so that the equation would look like this:

$$1 + 2 \times 3 = 7$$

No other solution is possible and without some instruction in the hierarchy of operations, all but the most advanced students will have difficulty with this problem. Once learners understand this simple rule, however, they will enjoy trying to solve the problems and will look forward to mastering the more difficult levels.

Example 2

$$4 \div 7 \div 7 = 5$$

In the problem, division must be done first. No multiplication is required to complete the equation; therefore, division, as the next operation in the hierarchy of operations, is performed first. Then, the addition is done. The solution, then is

$$4 + 7 \div 7 = 5$$

In summary, most of the equations your students will be asked to complete will require a simple left to right progression of arithmetical signs. However, in those problems that require combinations of multiplication or division with addition or subtraction, it is critical that learners understand the hierarchy of operations and use that rule in providing the appropriate signs.

Negative Numbers

Since the problems presented in *Math In a Nutshell* are generated at random, the learner, on a rare occasion, will have to calculate negative numbers in the equations. Although numbers appearing to the right of the $=$ sign will never be negative numbers, an equation such as the one that follows might arise and you should prepare your students for that possibility:

$$6 \div 9 \div 3 = 0$$

To achieve a result of 0 in this problem, the learner must first subtract 9 from 6 and then add the result, -3, to 3 which, of course, is 0. The solution, therefore, is

$$6 - 9 + 3 = 0$$

Your students will seldom see equations such as these but should be alert to them if they do appear.

Math In a Nutshell can be a valuable teaching tool in your educational software library. With only a minimum of explanation to the class before they begin working with it, this program will provide hours of challenging math problem-solving for individual students or learners working in small groups.